

PCB Source Investigation - Overview -

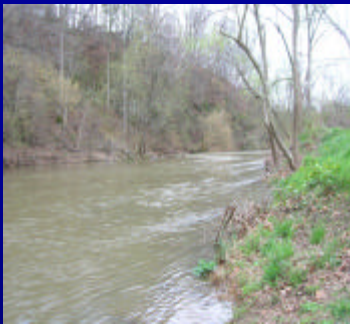
for the

Development of the Roanoke River TMDL

Mark Richards

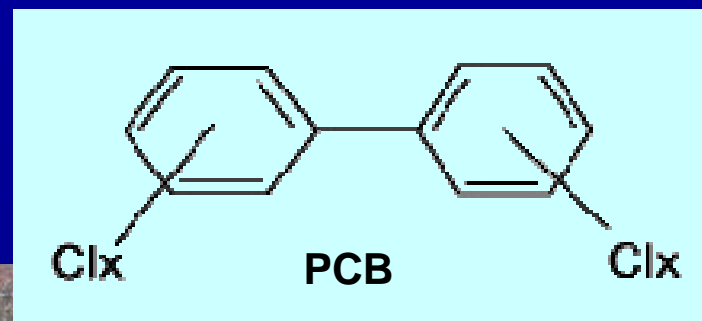
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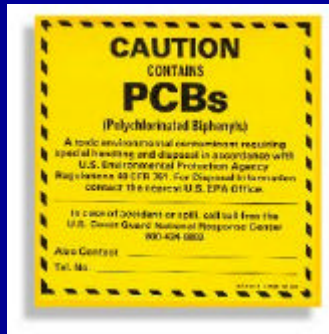
July 29, 2009



Presentation Topics

- PCB Background
 - Why do we care?
- Monitoring
- Results
- PCB WQC vs. Site Specific Endpoints



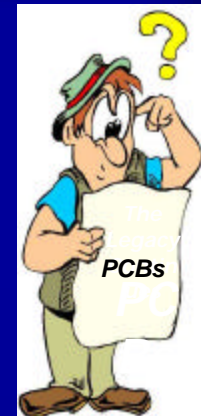


PCBs

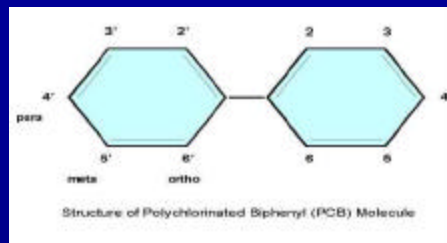
- Estimated that > 1.5 Billion lbs. manufactured in the U.S. until 1977 - “Legacy Contaminant”
- Very stable and heat resistant
 - Persistent in environment
- Common uses:
 - Transformers, capacitors, hydraulic fluids, circuit breakers, PVC Products, carbonless copy paper, caulking material, paints, etc.



PCBs – What are They?



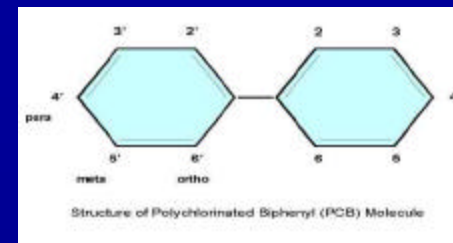
- Biphenyl molecule (1-10 chlorine atoms)



- 209 distinct PCB Compounds
- Regulated by VADEQ as Total PCB (tPCB)
= 209 Compounds Summed
- Referred to as PCB Aroclors (Monsanto tradename) = mixture of PCB compounds

PCBs – Why Do We Care?

- Suspected Carcinogen
- Other Toxicological Effects (humans)
 - Immunotoxicity, reproduction and developmental, hepatotoxicity (liver), neurotoxicity, and chloracne
- Major Sources of Exposure
 - Consumption of contaminated fish
 - Inhalation (dust from contaminated sites)



VA Regulatory Criteria

**Consumption
Advisories
Fish Tissue
(ppb)**

50

**Water Quality
Criterion**

Total PCBs (ppb)

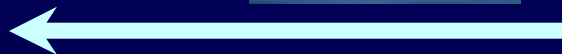
(Awaiting final approval from EPA)

0.00064

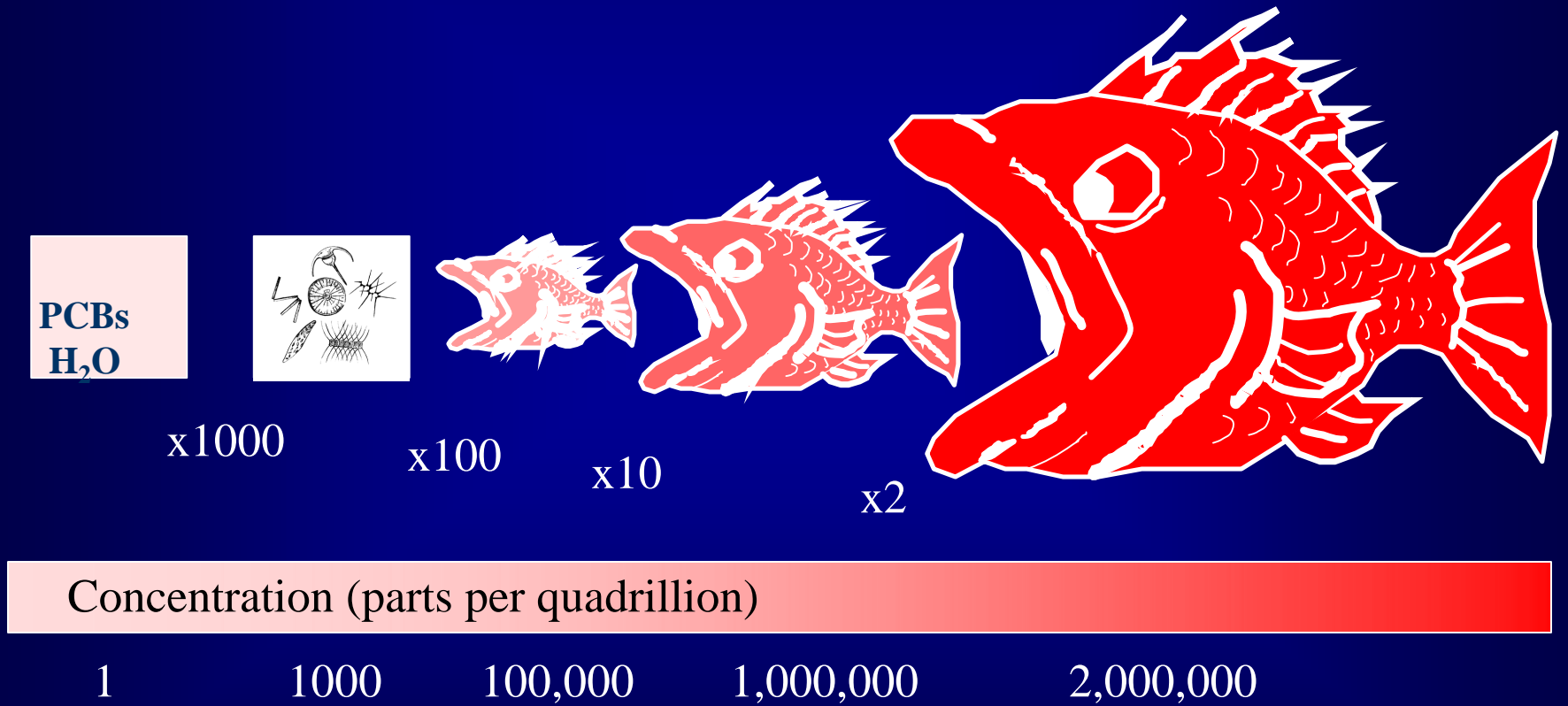
–WQC represents concentration in water column where accumulation of PCBs in fish should be at a level protective of fish tissue for consumption (humans)

How Are Fish Exposed To PCBs?

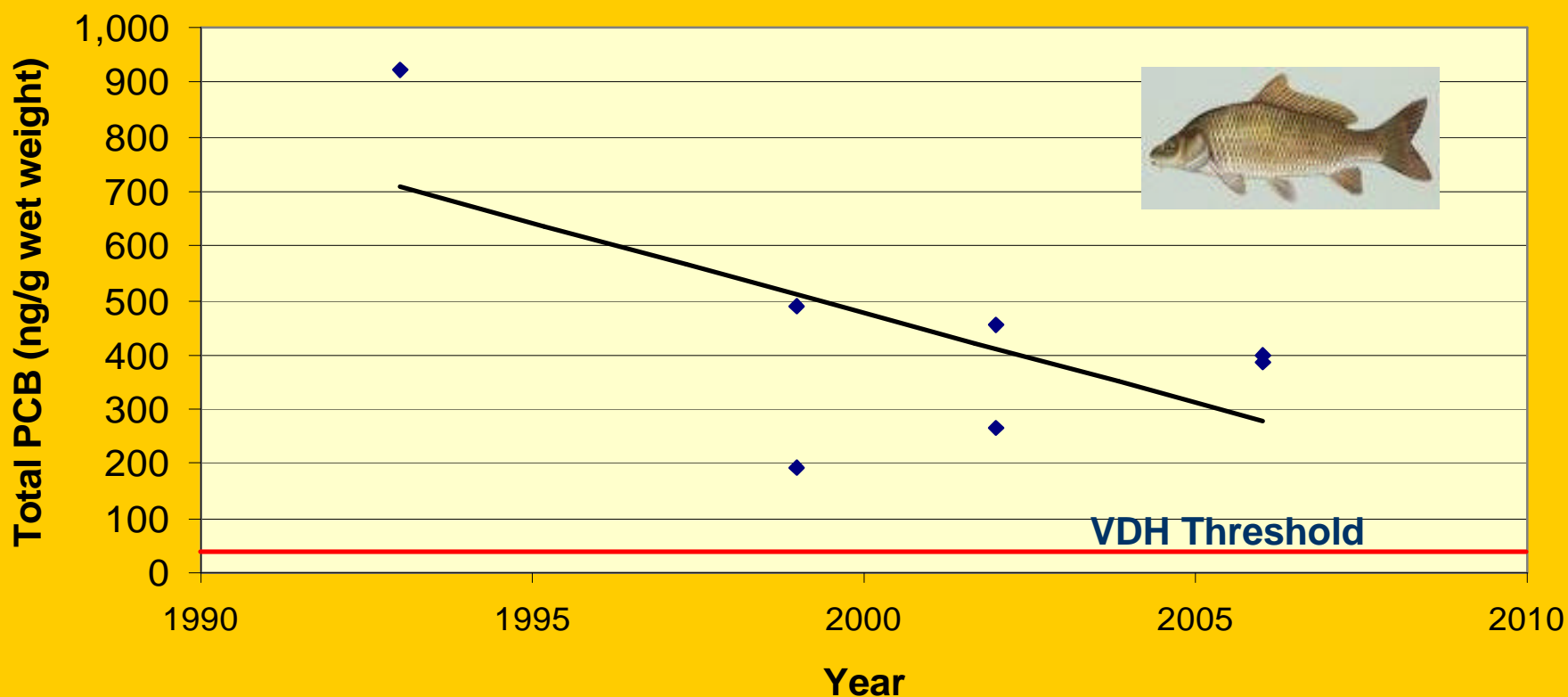
- Intake through gills from water column
 - Basis of existing WQC (1980 EPA guidelines)
- Ingestion of contaminated sediment
 - Indirect uptake from foraging
- Exposure through skin from contaminated sediment (e.g. catfish)
- Ingestion of prey
 - Biomagnification



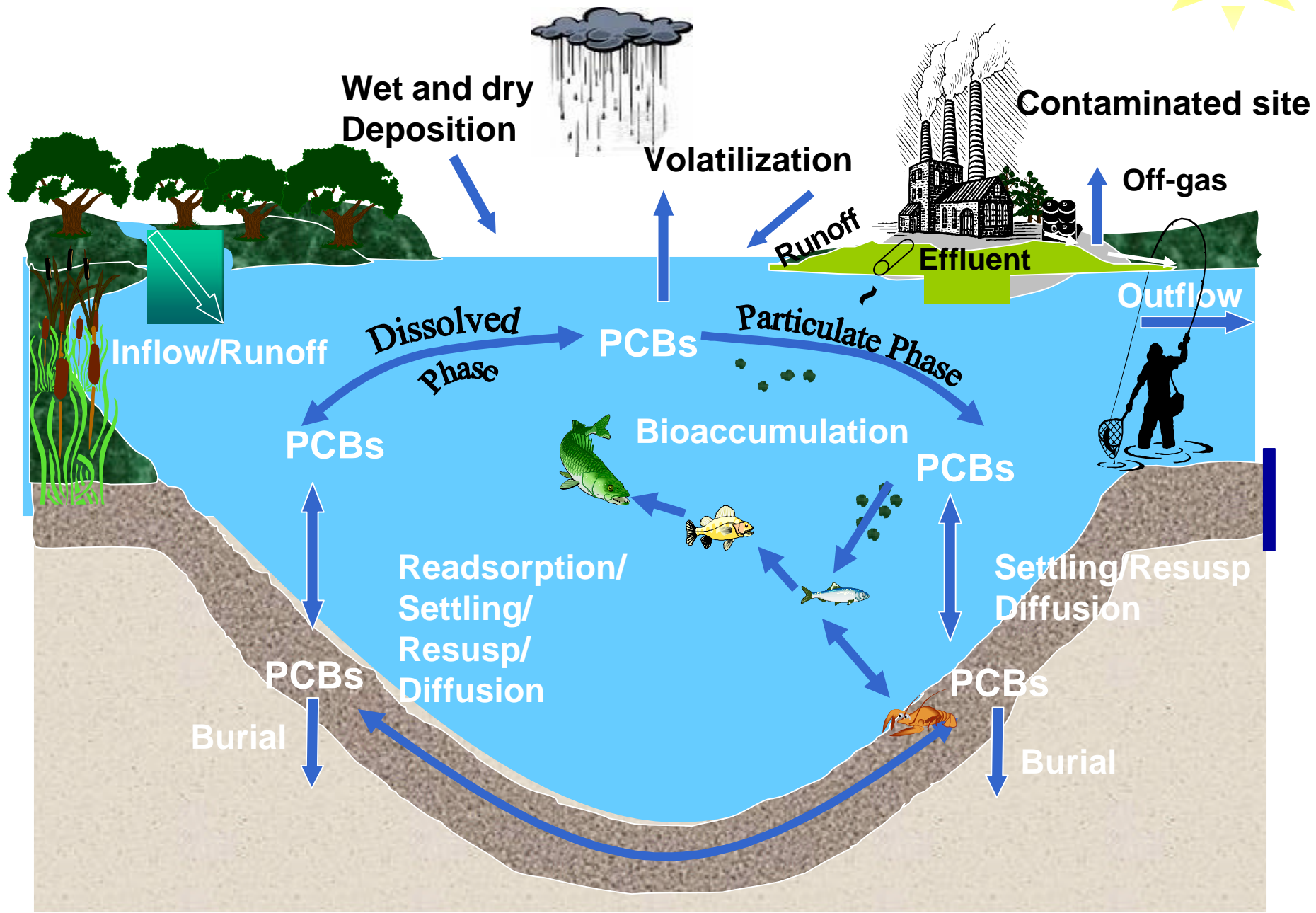
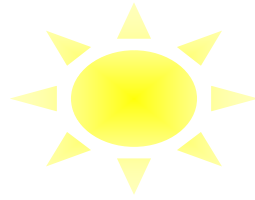
Biomagnification



Ave. Total PCB Concentrations in Common Carp Collected at Multiple Stations in the Upper Roanoke River Between 1993 and 2006



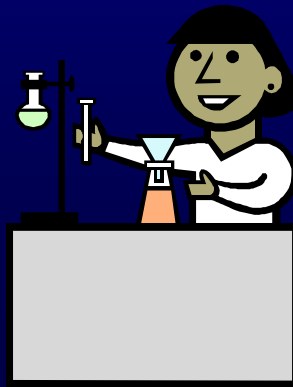
PCBs – Sources/Fate & Transport



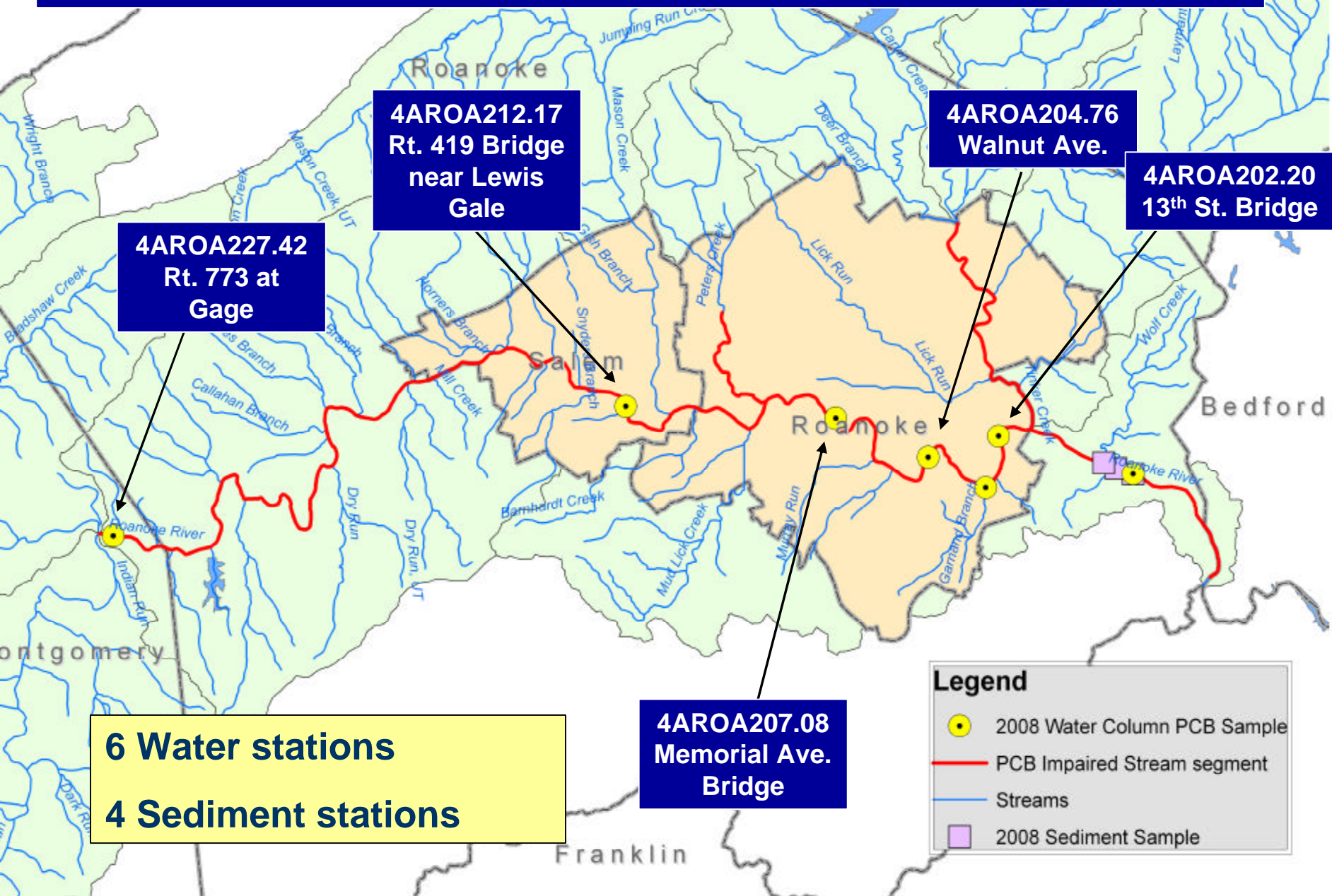
PCB Source Investigation

PCB Analytical Tool (Low Detection Method)

- With old methods, PCBs could not be detected in water
 - Not sensitive enough for low levels
- More sensitive analytical method now available
 - Can be detected at very low levels
 - Enables VADEQ to find new sources

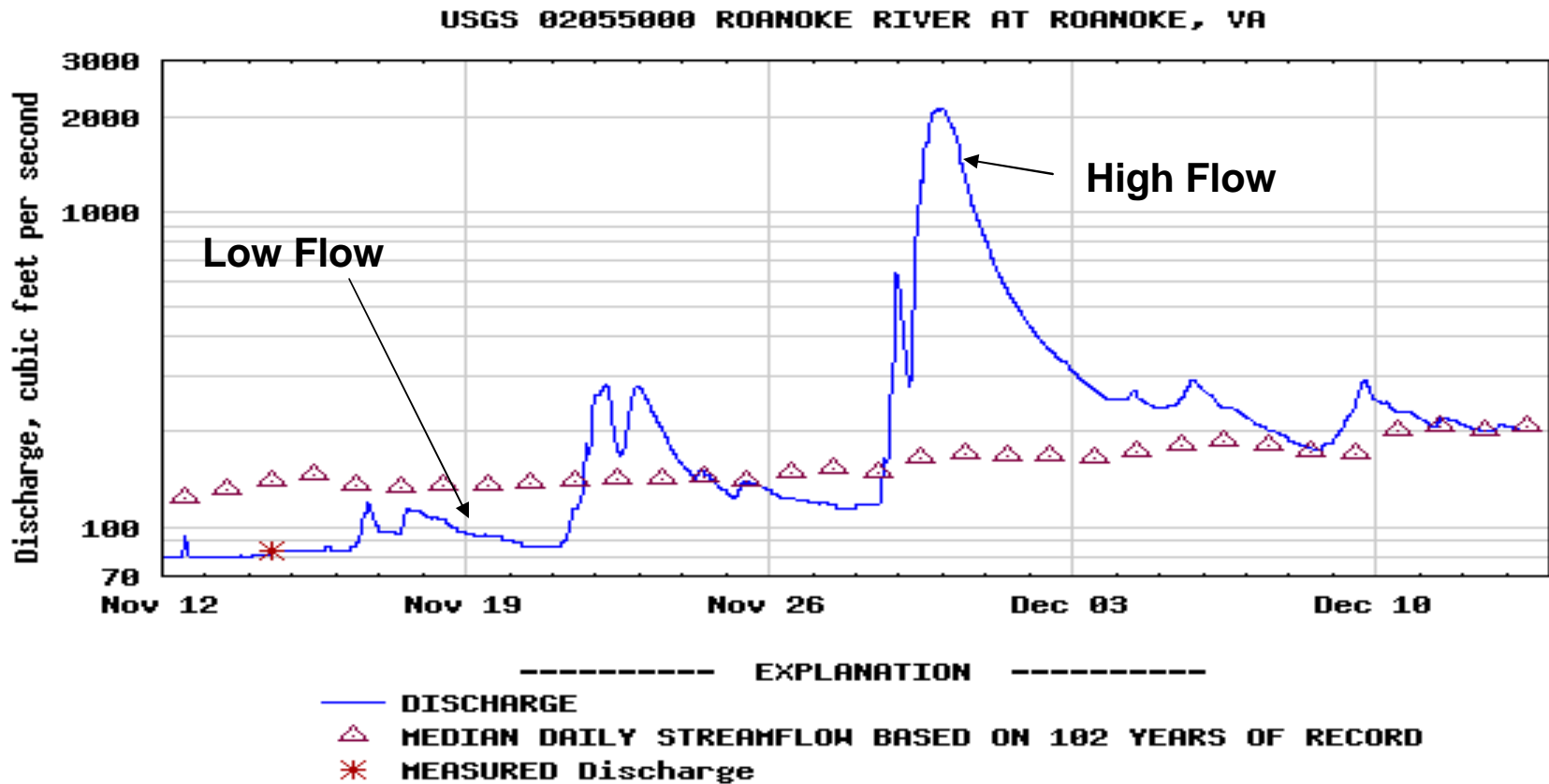


Upper Roanoke River 2008 Sampling



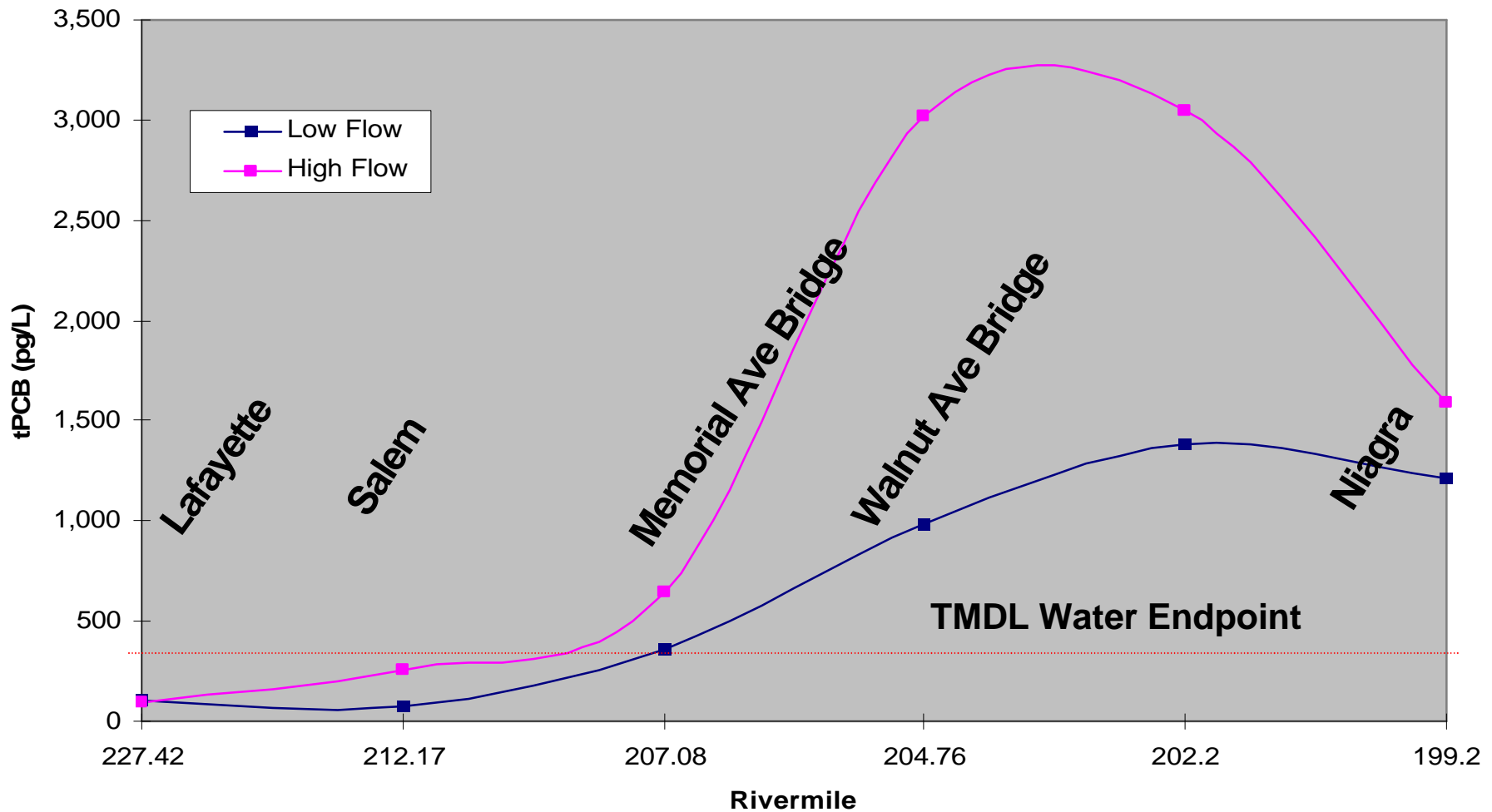
River PCB Monitoring Design

- Low & high flow condition
- Accounts for event driven PCB loads

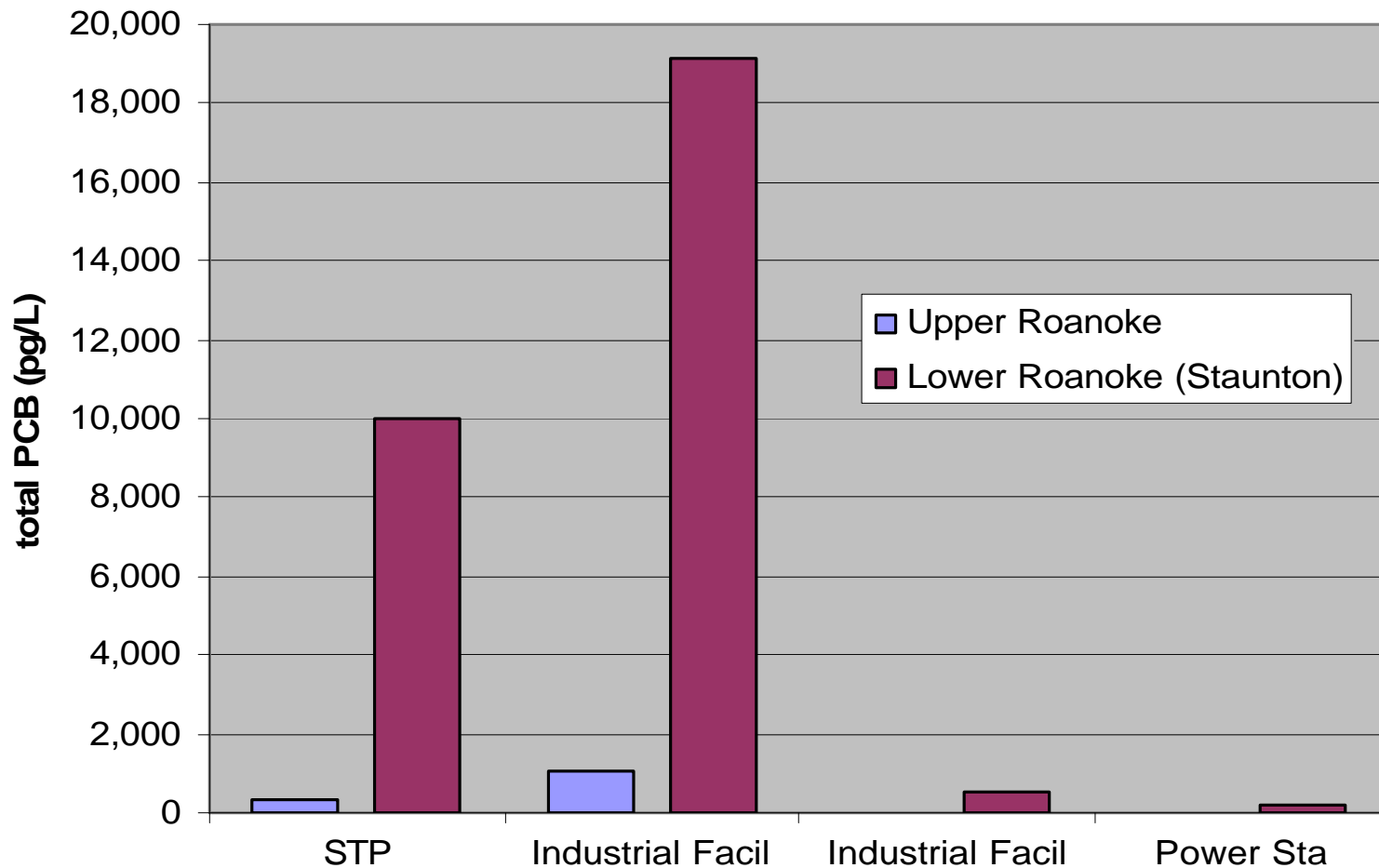


Results

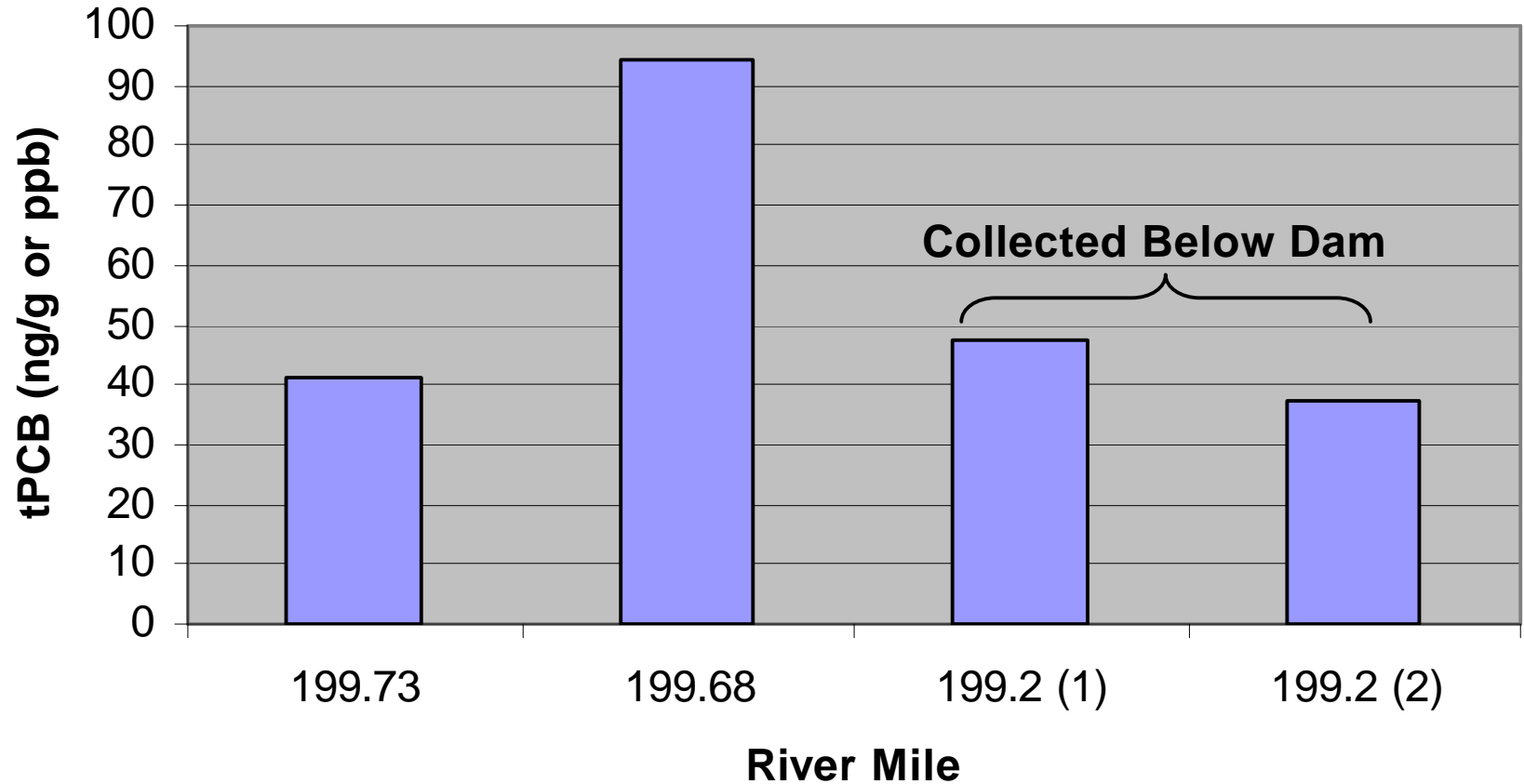
Total PCB concentrations (pg/L) in ambient water collected from the upper Roanoke River during low and high flows



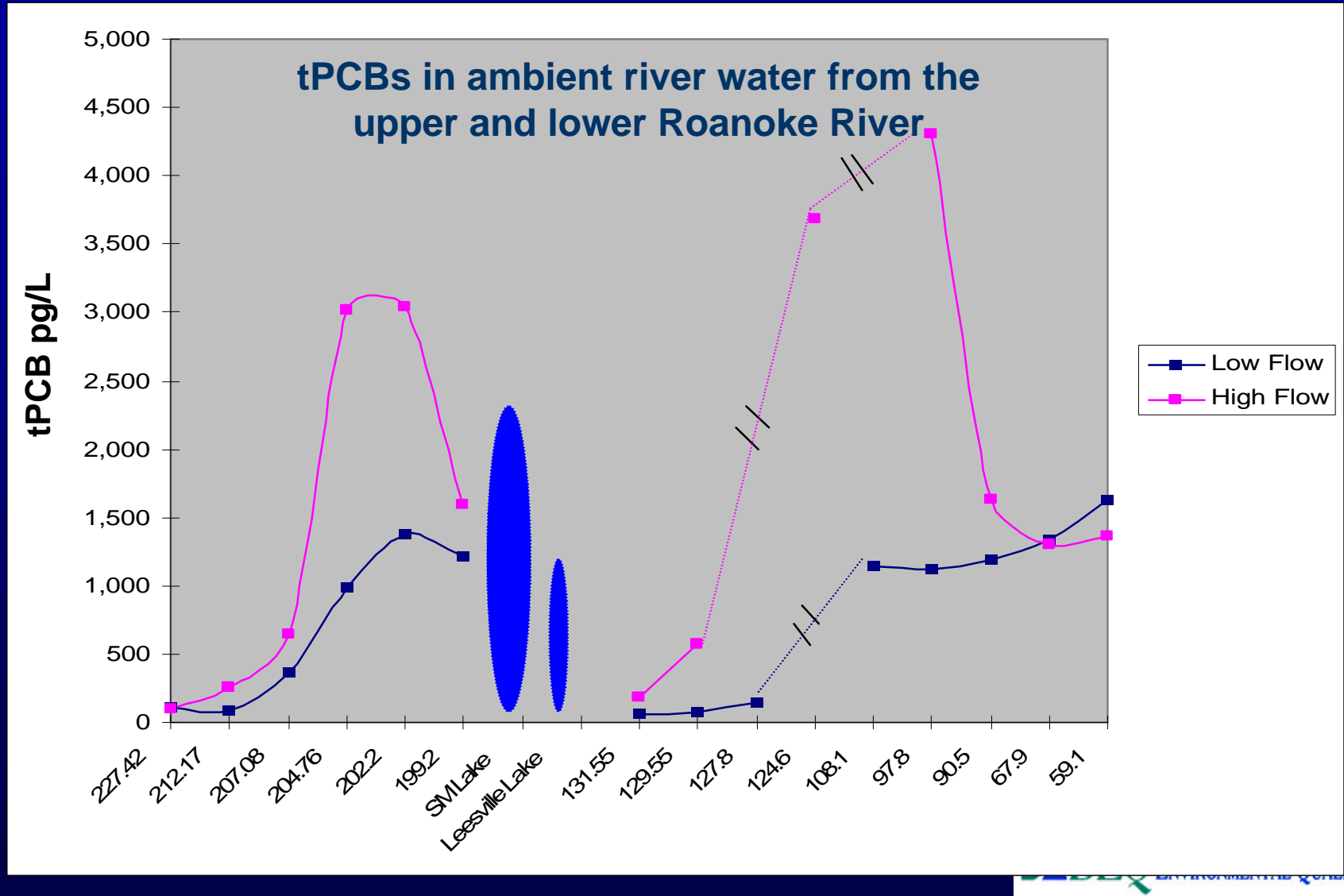
PCBs – Point Sources



tPCB in sediment collected in the Roanoke River above and below Niagara Dam



Comparison between the Upper Roanoke & Lower (Staunton) River



Site Specific Endpoints

- Upper Roanoke River
 - Based on Carp (species included on VDH fish consumption advisory list)
 - Sample size adequate (n = 20)
 - Target water concentration = 390 pg/L
- Lower Roanoke River
 - Based on Striped Bass (species included on VDH fish consumption advisory list)
 - Sample size more than adequate (n = 62)
 - Target water concentration = 140 pg/L

Questions?

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